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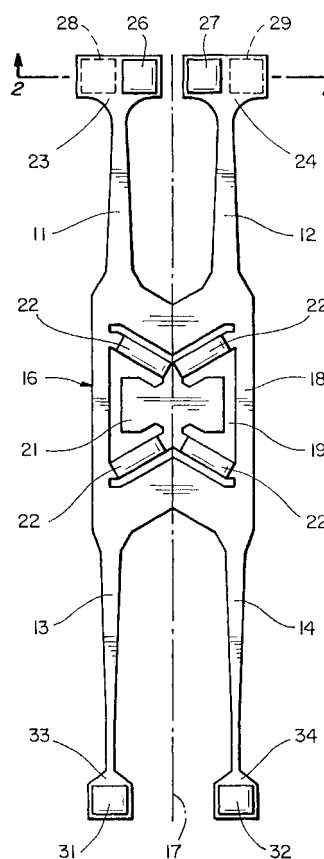
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(30) Priority: **13.07.2000 US 615294**

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(54) **Tuning fork with reduced error**

(57) Tuning fork and method in which a pair of elongated tines having front and rear surfaces are disposed symmetrically about an axis, and balancing masses on the front surface of one tine and on the rear surface of the other tine are trimmed to reduce quadrature error and also to maintain mass balance between the tines.



FIG_1

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EUROPEAN SEARCH REPORT

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EP 01 30 5192

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 4 930 351 A (MACY DAVID F ET AL) 5 June 1990 (1990-06-05) * column 8, line 66 - column 9, line 10; figure 1 *	1,3-13	G01C19/56
A	EP 0 503 807 A (NEW SD INC) 16 September 1992 (1992-09-16) * column 9, line 17 - column 40; figures 1-3 *	1,3-13	
A	US 5 585 562 A (OZAKI TAKASHI ET AL) 17 December 1996 (1996-12-17) * column 16, line 15 - line 22; figure 15 *	3,12,13	
A	US 6 010 919 A (MATSUHIRO YASUSHI ET AL) 4 January 2000 (2000-01-04) * column 5, line 24 - column 6, line 25; figures 1,2 *	7	
A	US 3 766 616 A (STAUDTE J) 23 October 1973 (1973-10-23) * column 3, line 37 - column 5, line 28; figures 1-3 *	9	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7) G01C G01P
Place of search		Date of completion of the search	Examiner
Munich		18 November 2004	Springer, 0
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

see annex



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**LACK OF UNITY OF INVENTION
SHEET B**

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1,3-13

Tuning fork for an inertial sensor having additional masses at the end of the tines, the masses are placed at the front and rear surfaces of the tines and are trimmed to reduce the quadrature error signal and to balance the tuning fork

2. claim: 2

Tuning fork for an inertial sensor having tines with free ends of enlarged area comprising balancing masses on the front and rear sides of the enlarged areas. The tines are fabricated of a transparent material to allow laser trimming of all masses from one side

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4930351	A	05-06-1990	NONE	

EP 0503807	A	16-09-1992	AT 143489 T	15-10-1996
			AU 659434 B2	18-05-1995
			AU 1137792 A	17-09-1992
			CA 2062114 A1	13-09-1992
			DE 69213976 D1	31-10-1996
			DE 69213976 T2	03-04-1997
			EP 0503807 A2	16-09-1992
			JP 3007216 B2	07-02-2000
			JP 5256723 A	05-10-1993
			US 5343749 A	06-09-1994
			US 5408876 A	25-04-1995
			US 5522249 A	04-06-1996

US 5585562	A	17-12-1996	JP 7113645 A	02-05-1995
			DE 69410917 D1	16-07-1998
			DE 69410917 T2	17-12-1998
			EP 0649002 A1	19-04-1995

US 6010919	A	04-01-2000	JP 3512968 B2	31-03-2004
			JP 9330892 A	22-12-1997
			DE 19715194 A1	30-10-1997

US 3766616	A	23-10-1973	US 3969640 A	13-07-1976
			CH 566675 A5	15-09-1975
			CH 588733 B5	15-06-1977
			CH 1091873 A	15-09-1976
			DE 2313574 A1	04-10-1973
			FR 2176946 A1	02-11-1973
			GB 1381996 A	29-01-1975
			JP 923229 C	22-09-1978
			JP 49008212 A	24-01-1974
			JP 52047982 B	06-12-1977

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82